Poster ID:

FIRE RISK ASSESSMENT OF HERITAGE BUILDING – PERSPECTIVES OF BUILDING STAKEHOLDERS

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ABSTRACT

Heritage building is very important in preserving the culture and to the tourism potential. Hence, the proper budget allocation to the prevention of fire loss is critical. Budget allocation is normally based on fire risk assessment. The assessment is interpreted based on the perception of stakeholders. Using structured interview and analytic hierarchy process (AHP) this study identifies and explains the diversity of fire risk perception of stakeholders

INTRODUCTION

Heritage building is a listed building of historical significance and irreplaceable. It has no dimensional value but significant to cultural preservation. One of the risks to the survival of heritage building is fire. Most of them were built prior to the formulation of Uniform Building By Laws 1984, hence, the heritage buildings are not subjected to the provision of fire safety requirement provided by the By Laws. Allocation of funds for upgrading of heritage buildings susceptible to fire risk depends on the perception of stakeholders which are different from one stakeholder to the other. At least 3 parties involved in the assessment of fire risk of heritage building: Fire Rescue Department Malaysia personnel (fire officers), consultants (for example architect, engineer, quantity surveyor, interior designer) and contractors/restorers. Their perception may be different from one party to another

Objectives of Study

To assess perception on fire risk of the stakeholders
To explain the diversity of perception among the stake holders

METHODOLOGY

Summary of Methodology

First, adopt the criteria and attributes of risk assessment from a previous instrument (Khirani , 2011). The criteria and attributes are in Figure 1. Second, analyse the typology of listed heritage buildings maintained by National Department of Heritage in terms of category and ownership. The target groups were taken from subpopulation with highest number of building. Third, the stake holders of target group were identified for structured interview. Only stakeholders that responded were included in this study. The interview checklist was adapted from Khirani (2011). Figure 2 shows the criteria. Figure 3 shows attributes of one of the criteria. Fourth, the structured interviews were conducted. Fifth, the perception of the stakeholders was analysed based on AHP principles using Expert Choice 2000 software.

GOAL OF STUDY			
To Evaluate Fire Risk In Heritage Buildings			
CRITERIA			
Passive Protection System (PPS)	Active Protection System (APS)	Fire Management (FM)	Building Characteristics (BC)
ATTRIBUTES (extract from literature reviews)			
Compartmentation	Detection and Alarm System	Housekeeping and Maintenance	Building Contents
Egress/ Evacuation Route	Automatic Suppression System	Management Fire Safety Plan	Building Fabric/ Material)
Corridor Width	Fire Hydrant	Security	Architectural Features
Number of Exit	Portable Fire Extinguisher	Staff Training	Building Status
Maximum Travel Distance	Emergency Lighting	Fire Officer/Marshall	Historical significance
Exit Signages	Hose Reel and Stand pipe	Emergency Response	
Site Accessibility	Communications	External Exposure to Fire	

Figure 1 : The Criteria and their Attributes

With the goal of ***minimising fire risks in heritage buildings***, which of the criteria given below in your opinion is ***more*** important than their pairs? Please circle your your answer according to their importance rating, being;

1 – Equal Importance , 2 – Slight Importance 3 – Moderate Importance 4 – Moderate Plus
5 – Strong Importance 6 – Strong Plus 7 – Very Strong 8 – Very Strong Plus
9 – Extreme Importance

CRITERIA	RANKING																	CRITERIA
Passive Protection System	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Active Protection System
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Fire Management
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Building Characteristics
Active Protection System	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Fire Management
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Building Characteristics
Fire Management	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Building Characteristics

Figure 2 : Criteria - Checklist

PART 3 : PAIR-WISE OF THE ATRIBUTES

With the goal of ***minimising fire risks to heritage buildings***, which of the attributes given below in your opinion contribute ***more*** to the fire risks than their pairs? Please circle your your answer according to their importance rating.

ATTRIBUTES FOR CRITERIA 1 : Passive Protection System Definition - Physical condition of the buildings that has the potential of preventing fire propagation.																		
Compartmentation	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Egress /Evacuation Route
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Corridor Width
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Number of Exit
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Max. Travel Distance
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Exit Signages
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Site Accesibility
Egress /Evacuation Route	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Corridor Width
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Number of Exit
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Max. Travel Distance
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Exit Signages
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Site Accesibility
Corridor Width	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Number of Exit
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Max. Travel Distance
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Exit Signages
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Site Accesibility
Number of Exit	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Max. Travel Distance
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Exit Signages
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Site Accesibility
Max. Travel Distance	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Exit Signages
	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Site Accesibility
Exit Signages	9	8	7	6	5	4	3	2	1	2	3	4	5	6	7	8	9	Site Accesibility

Figure 3 : Attributes of Passive Protection System - Checklist

RESULTS

The analysis generates weightage of criteria for each respondent as in Figure 4. Table 1 shows the weightage for each respondent. In the table the respondents are grouped as consultants, insurance practitioner, fire officers (Fire Rescue Department Malaysia personnel), and contractor / restorer. The table suggests three findings. First, the perception of fire officers and contractor/restorer was similar. To them active protection system and fire management are the more important criteria. Second, insurance practitioners perceived building characteristic and fire management as the more important criteria. Third, as a group consultants perceived fire management as the most important. However, the perception varies within the group. Consultant with management background perceived fire management as the most important criterion. Consultant with risk management background perceived passive and fire management are more important criteria. Consultant with design background perceived the all criteria are equally important.

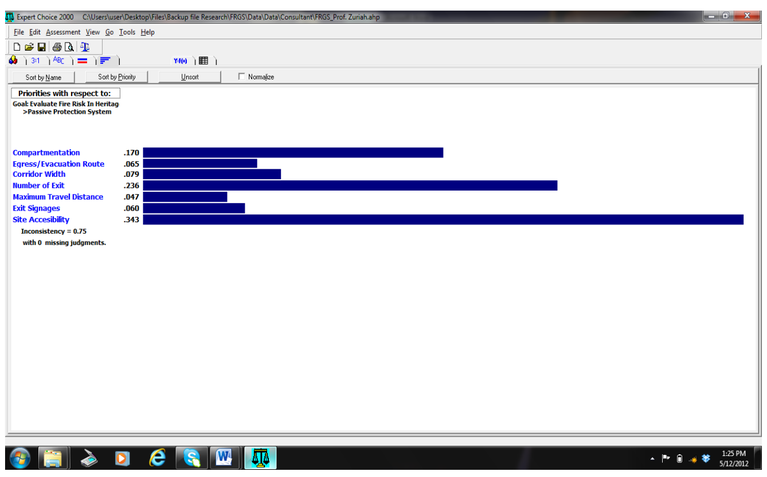

Figure 4a : Example of AHP Output

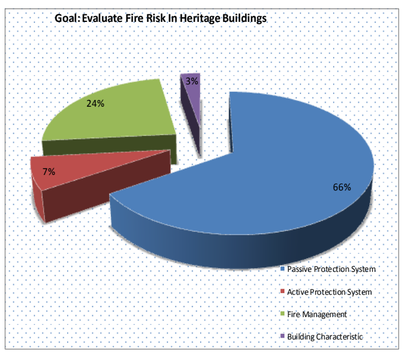

Figure 4b : Example of Weightage

Figure 4 : Perception's Weightage of Criteria for one of respondents

Consultant	Respondent 1	Respondent 2	Respondent 3
Passive Protection System	66%	6%	25%
Active Protection System	7%	16%	25%
Fire Management	24%	69%	25%
Building Characteristic	3%	9%	25%

	Respondent 4	Respondent 5	Respondent 6
Passive Protection System	27%	43%	12%
Active Protection System	4%	21%	26%
Fire Management	39%	9%	32%
Building Characteristic	30%	27%	30%

FRDM	Respondent 7	Respondent 8
Passive Protection System	8%	21%
Active Protection System	66%	12%
Fire Management	24%	60%
Building Characteristic	2%	7%

Restorer	Respondent 9	Respondent 10	Respondent 11	Respondent 12	Respondent 13
Passive Protection System	24%	6%	23%	16%	12%
Active Protection System	31%	23%	14%	47%	26%
Fire Management	14%	66%	14%	24%	32%
Building Characteristic	31%	5%	49%	13%	30%

Table 1 : Perception's Weightage for each respondent

CONCLUDING REMARKS

The study suggests the diversity of perceptions is influenced by the nature of criteria and the nature of work the stakeholders. Due to its nature all the stakeholders are aware of the importance of fire management. This includes housekeeping and maintenance management, fire safety plan, security and staff training on fire safety and appointment of fire marshal in the building. For example, everybody in office should be aware of who is the fire marshal of the floor and the fire safety plan. In contrast, not everybody is aware of the passive protection system. Therefore, fire management is perceived as the most important.

The nature of work of stakeholders influences the perception:

i. Active protection system is perceived as important by fire officers and contractor/restorer. This could be explained since fire department conduct regular inspection particularly to ensure fire detection, communication and alarm automatic suppression systems, and fire hydrant are working. The contractor service is employed to ensure the systems are well maintained
ii. Insurance practitioner perceived building characteristics as important since insured amount is normally based on building content, building fabric and material.
iii. Consultant with design background perceived all criteria are important. This could be explained since design deals with the first three criteria: active and passive fire protection system, and building characteristics. As an occupant of building the consultant is also aware of the fourth criterion, fire management..

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